

1 WHAT IS CLAIMED IS:

✓ 1. A laser comprising:
a first region with a first waveguide, said first
waveguide including a first diffraction grating;
5 a second region with a second waveguide, said second
waveguide including a second diffraction grating; and
a phase controlling region with a third waveguide,
said phase controlling region including phase control
means for controlling an effective refractive index of
10 said third waveguide, and said phase controlling region,
said first region and said second region being serially
coupled to each other along a light propagation direction
in this order, and being constructed such that light to
said first region from said phase controlling region is
15 enlarged relatively to light to said phase controlling
region from said first region.

✓ 2. A laser according to claim 1, a coupling
coefficient of said first diffraction grating in said
20 first region adjacent to said phase controlling region
being set smaller than a coupling coefficient of said
second diffraction grating in said second region.

✓ 3. A laser according to claim 1, said first region
25 further including first control means for pumping said
first region, and said phase control means and said first
control means being capable of independently controlling

1. said phase controlling region and said first region,
respectively.

✓4. A laser according to claim 3, said phase control
5 means and said first control means being capable of
independently injecting currents into said phase
controlling region and said first region, respectively.

✓5. A laser according to claim 1, said first region
10 further including first control means for pumping
said first region, said second region further including
second control means for pumping said second region,
and said first control means and said second control
means being constructed such that a pumping amount
15 of said first region can be smaller than a pumping
amount of said second region.

✓6. A laser according to claim 1, said laser being
constructed as a distributed feedback semiconductor
20 laser.

✓7. A laser according to claim 6, said phase
controlling region further including a cleaved end facet.

25 ✓8. A laser according to claim 7, a reflective layer
being provided on said cleaved end facet.

1 9. A laser according to claim 6, said second region
further including an antireflection layer provided on a
cleaved end facet of said second region.

5 10. A laser comprising:
a first region with a first waveguide, said first
waveguide including a first diffraction grating;
a second region with a second waveguide, said second
waveguide including a second diffraction grating; and
10 a phase controlling region with a third waveguide,
said phase controlling region including control means for
controlling an effective refractive index of said third
waveguide, and said phase controlling region, said first
region and said second region being serially coupled
15 along a light propagation direction in this order, and
being constructed such that a coupling coefficient
of said first region adjacent to said phase controlling
region being set smaller than a coupling coefficient of
said second region.

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11. A laser according to claim 10, said phase
controlling region, said first region and said second
region being constructed such that light to said first
region from said phase controlling region is enlarged
25 relatively to light to said phase controlling region from
said first region.

1 ✓12. A laser according to claim 10, said first region
further including first control means for pumping said
first region, and said phase control means and said first
control means being capable of independently controlling
5 said phase controlling region and said first region,
respectively.

✓13. A laser according to claim 12, said phase
control means and said first control means being capable
10 of independently injecting currents into said phase
controlling region and said first region, respectively.

✓14. A laser according to claim 10, said first region
further including first control means for pumping said
15 first region, said second region further including second
control means for pumping said second region, and said
first control means and said second control means being
constructed such that a pumping amount of said first
region can be smaller than a pumping amount of said
20 second region.

✓15. A laser according to claim 10, said laser being
constructed as a distributed feedback semiconductor
laser.

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✓16. A laser according to claim 15, said phase
controlling region further including a cleaved end facet.

1 17. A laser according to claim 16, a reflective layer
being provided on said cleaved end facet.

5 18. A laser according to claim 15, said second region
further including an antireflection layer provided on a
cleaved end facet of said second region.

10 19. A method for driving a laser, said method
comprising the steps of:

preparing a laser including:

 a first region with a first waveguide, said
first waveguide including a first diffraction grating;

 a second region with a second waveguide,
said second waveguide including a second diffraction

15 grating; and

 a phase controlling region with a third waveguide,
said phase controlling region including phase control
means for controlling an effective refractive index of
said third waveguide, and said phase controlling region,

20 said first region and said second region being serially
coupled to each other along a light propagation direction
in this order, and being constructed such that light to
said first region from said phase controlling region is
enlarged relatively to light to said phase controlling
25 region from said first region; and

 changing a current injected into or a reverse
voltage applied to the phase controlling region to change

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1 at least one of a polarization mode and a waveguide of
light output from the laser.

✓ 20. A light transmitter comprising:

5 a laser including:

a first region with a first waveguide, said
first waveguide including a first diffraction grating;

a second region with a second waveguide,
said second waveguide including a second diffraction
10 grating; and

a phase controlling region with a third waveguide,
said phase controlling region including phase control
means for controlling an effective refractive index of
said third waveguide, and said phase controlling region,
15 said first region and said second region being serially
coupled to each other along a light propagation direction
in this order, and being constructed such that light to
said first region from said phase controlling region is
enlarged relatively to light to said phase controlling
20 region from said first region;

control means for controlling light output from said
laser in accordance with a transmission signal; and

a mode selector for selecting a component of a
desired mode from the light output from said laser.

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✓ 21. A light transmitter according to claim 20, said
mode selector comprising a polarization-mode selector.

1 22. A light transmitter according to claim 20, said
mode selector comprising a wavelength selector.

5 23. An optical communication system for
communicating over a light transmission line that transmits
a signal from a transmitter side to a receiver side, said
system comprising:

a light transmitter for transmitting light of a
signal through the light transmission line including:

10 a laser including:

a first region with a first waveguide, said
first waveguide including a first diffraction grating;

a second region with a second waveguide,
said second waveguide including a second diffraction
15 grating; and

a phase controlling region with a third waveguide,
said phase controlling region including phase control
means for controlling an effective refractive index of
said third waveguide, and said phase controlling region,
20 said first region and said second region being serially
coupled to each other along a light propagation direction
in this order, and being constructed such that light to
said first region from said phase controlling region is
enlarged relatively to light to said phase controlling
25 region from said first region;

control means for controlling light output
from said laser in accordance with a transmission

1 signal; and

a mode selector for selecting a component
of a desired mode from the light output from said
laser; and

5 a receiver for receiving and detecting an
intensity-modulated signal transmitted from the laser
through the light transmission line.

✓ 24. An optical communication system according to
10 claim 23, said system being a wavelength division
multiplexing optical communication system, in which the
light transmission line transmits a plurality of
intensity-modulated signals at a plurality of wavelengths
generated by a plurality of said transmitters, and a
15 wavelength selector selects the intensity-modulated signal
at a desired wavelength to be detected on a side of said
receiver.